

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



REC'D 19 JUL 2004

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Applicant's or agent's file reference 62848A	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US 03/34196	International filing date (day/month/year) 28.10.2003	Priority date (day/month/year) 31.10.2002
International Patent Classification (IPC) or both national classification and IPC C08G18/08		
Applicant DOW GLOBAL TECHNOLOGIES, INC. et al.		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 2 sheets.

- This report contains indications relating to the following items:
  - I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application

Date of submission of the demand  17.05.2004	Date of completion of this report  16.07.2004
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Neugebauer, U  Telephone No. +49 89 2399-6075  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/US 03/34196**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-3, 5-20 as originally filed  
4, 4a received on 26.02.2004 with letter of 23.02.2004

**Claims, Numbers**

1-15 as originally filed

**Drawings, Sheets**

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
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International application No. PCT/US 03/34196

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-15
	No: Claims	
Inventive step (IS)	Yes: Claims	1-15
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-15
	No: Claims	

2. Citations and explanations

**see separate sheet**

**Re Item V**

**Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

D1: US-A-4237264 (cited by the applicant)

D2: EP-A-1044998

**1. Novelty (Art. 33(2) PCT)**

The subject-matter of present claims **1** to **15** is considered novel over the prior art documents cited in the International Search Report and the application, since none of the documents discloses a polyurethane (PU) dispersion comprising a mixture of a bis(isocyanatomethyl)cyclohexane compound and a molecule having hydrogen active moieties, its method of production and a (light stable) coating, film, elastomer or microcellular foam produced therefrom.

**2. Inventive step (Art. 33(3) PCT)**

The subject-matter of present claims **1** to **15** is based on an inventive step, since there is no hint in document D1, which is considered to represent the closest prior art, alone or in combination with any other document cited in the International Search Report for the claimed PU dispersion for the following reasons:

D1 discloses a process for preparing a water-dispersible PU, based on a polyester polyol and 3-isocyanatomethyl-3,5,5-trimethylcyclohexylisocyanate(IPDI) (cf. D1, example 8).

The PU-dispersion claimed in the present claims differs from the PU dispersion disclosed in D1 in that a bis(isocyanatomethyl)cyclohexane compound is used

As compared to the disclosure of D1, the problem to be solved by the present

application may be regarded as to provide a PU dispersion used for producing polyurethane with good mechanical and chemical characteristics.

As can be seen from example 3, table 2, PU films with good mechanical properties (high tensile strength) can be obtained from an aqueous PU dispersion prepared from polyols and a mixture of 1,3- and 1,4-bis(isocyanatomethyl)cyclohexane.

Since there is no teaching in D1 for PU dispersions comprising bis(isocyanatomethyl)cyclohexane compounds and no teaching in any other document found in the International Search Report (D2 discloses NCO-prepolymers based on bis(isocyanatomethyl)cyclohexane, but no hint can be found for their use in PU dispersions) for this specific PU dispersion, its production method and the resulting products could not be rendered obvious by document D1.

Therefore, the presence of an inventive step can be acknowledged.

### 3. Industrial Applicability (Art. 33(4) PCT)

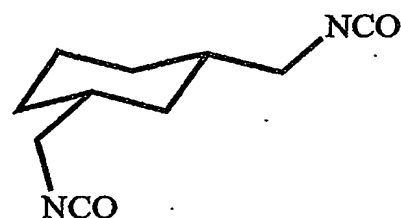
The present invention relates to aqueous PU dispersions to obtain PU coatings, films and elastomers and is thus industrially applicable.

Polyurethane prepolymers useful in the practice of the present invention are prepared by the reaction of active hydrogen compounds with any amount of isocyanate such that there is a stoichiometric excess of NCO groups to hydrogen reactive moieties, for example, -OH, amine or -SH groups. Isocyanate functionality in the prepolymers useful with the present invention can be present in an amount of from about 0.2 weight percent to about 20 weight percent. A suitable prepolymer can have a molecular weight in the range of from about 300 to about 10,000. Procedures for producing NCO terminated prepolymers are well known in the art.

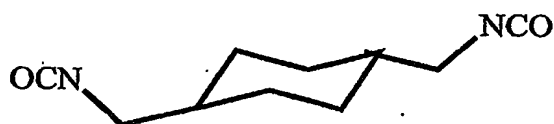
The cycloaliphatic diisocyanates useful in this invention comprise (i) trans-1,4-bis(isocyanatomethyl)cyclohexane or (ii) an isomeric mixture of two or more of cis-1,3-bis(isocyanatomethyl)cyclohexane, trans-1,3-bis(isocyanatomethyl)cyclohexane, cis-1,4-bis(isocyanatomethyl)cyclohexane and trans-1,4-bis(isocyanatomethyl)cyclohexane, with the proviso said isomeric mixture comprises at least about 5 weight percent of said trans-1,4-bis(isocyanatomethyl)cyclohexane. The preferred cycloaliphatic diisocyanates are represented by the following structural Formulas I through IV:



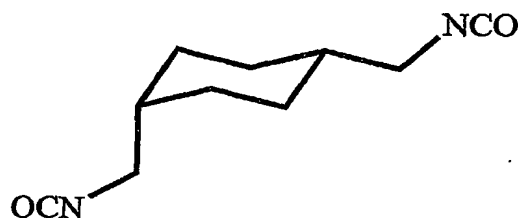
trans-1,3-bis(isocyanatomethyl)-  
cyclohexane  
Formula I



cis-1,3-bis(isocyanatomethyl)-  
cyclohexane  
Formula II



trans-1,4-bis(isocyanatomethyl)-  
cyclohexane  
Formula III



cis-1,4-bis(isocyanatomethyl)-  
cyclohexane  
Formula IV

These cycloaliphatic diisocyanates may be used in admixture as manufactured from, for example, the Diels-Alder reaction of butadiene and acrylonitrile, subsequent hydroformylation, then reductive amination to form the amine, that is., cis-1,3-bis(aminomethyl)cyclohexane, trans-1,3-bis(aminomethyl)cyclohexane, cis-1,4-bis(aminomethyl)cyclohexane and trans-1,4-bis(aminomethyl)cyclohexane, followed by reaction with phosgene to form the cycloaliphatic diisocyanate mixture. The preparation of the cyclohexane-bis(aminomethyl) is described in U.S. Patent 6,252.

Optionally, minor amounts of other multifunctional isocyanates can be used in the reaction mixture. Illustrative of such isocyanates are 2,4- and 2,6-toluene diisocyanates, 4,4'-biphenylene diisocyanate, 4,4'-diphenylmethane diisocyanate, meta- and para-phenylene diisocyanates, 1,5-naphthylene diisocyanate, 1,6-hexamethylene diisocyanate, bis(2-isocyanato)fumarate, 4,4'-dicyclohexanemethyl diisocyanate, 1,5-tetrahydronaphthylene diisocyanate, and isophorone diisocyanate. The minor amounts of other multifunctional isocyanates can range from about 0.1